PLANT ITEM MATERIAL SELECTION DATA SHEET

R10685022

CNP-VSL-00001, (PTF)
Cs Evaporator Eluate Lute Pot

ISSUED BY
RPP-WTP PDC

- Design Temperature (°F) (max/min): 237/40
- Design Pressure (psig) (internal/external): 40/Atm
- Location: incell

Contents of this document are Dangerous Waste Permit affecting

Operating conditions are as stated on attached Process Corrosion Data Sheet

Operating Modes Considered:

- The vessel is the stated pH at the normal operating temperature.
- The condition of high temperature due to self-boiling of Cs concentrate is assumed to be infrequent and of short duration.

Materials Considered:

Material (UNS No.)	Relative Cost	Acceptable Material	Unacceptable Material
Carbon Steel	0.23		X
304L (S30403)	1.00	X	
316L (S31603)	1.18	X	
6% Mo (N08367/N08926)	7.64	X	
Alloy 22 (N06022)	11.4	X	
Ti-2 (R50400)	10.1		X

Recommended Material: 304 (max 0.030% C; dual certified)

Recommended Corrosion Allowance: 0.040 inch (includes 0.024 inch corrosion allowance and 0.004 inch erosion allowance)

Process & Operations Limitations:

- Develop procedure for periodic flushing with water.

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6/14/06

6/15/06

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This bound document contains a total of 6 sheets.

REV	DATE	REASON FOR REVISION	PREPARER	CHECKER	APPROVER
1	6/14/06	Issued for Permitting Use	DLA	JRD	APR
0	6/22/04	Issued for Permitting Use			

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Corrosion Considerations:

This lute pot receives eluate from the IX columns.

a General Corrosion
In the proposed pH operating range, little specific information was found for the general/uniform corrosion of stainless steels or other material in the given waste. This lack of data is not critical because the alloys needed for the system typically fail by pitting, crevice corrosion, or cracking. On this basis, a corrosion allowance has little meaning though a nominal value is given.

Davis (1994) states the corrosion rate for 304L and 316L will be less than about 0.1 mpy at these temperatures.

Conclusion:
304L and 316L are both expected to be sufficiently resistant to the waste solution with a probable general corrosion rate of less than 1 mpy.

b Pitting Corrosion
With the stated conditions, 304L would be marginal but 316L is recommended. With thorough flushing with water, 304L is acceptable.

Conclusion:
The data from the flowsheets suggest there are sufficient halides to cause pitting in 304L unless thoroughly flushed.

c End Grain Corrosion
Not believed to be applicable to this system.

Conclusion:
Not applicable to this system.

d Stress Corrosion Cracking
The exact amount of chloride required to stress corrosion crack stainless steel is unknown. In part this is because the amount varies with temperature, metal sensitization, and the environment. But it is also unknown because chloride tends to concentrate under heat transfer conditions, by evaporation, and electrochemically during a corrosion process. Hence, even as little as a few ppm can lead to cracking under some conditions. Generally, as seen in Sedriks (1996) and Davis (1987), stress corrosion cracking does not usually occur below about 140°F. Further, the use of "L" grade stainless reduces the opportunity for sensitization.

Conclusion:
The use of 316L is recommended for the stated conditions. Though with flushing, 304L is acceptable.

e Crevice Corrosion
See Pitting.

Conclusion:
See Pitting

f Corrosion at Welds
Corrosion at welds is not a problem in the proposed environment.

Conclusion:
Weld corrosion is a not expected to be a concern.

g Microbiologically Induced Corrosion (MIC)
The proposed operating conditions are generally acceptable for MIC. However, MIC is not normally observed in operating systems

Conclusion:
MIC is not considered a problem.

h Fatigue/Corrosion Fatigue
Corrosion fatigue is not expected to be a concern

Conclusions
Not a concern.

i Vapor Phase Corrosion
Not expected to be a concern.

Conclusion:
Vapor phase corrosion is not expected.

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j Erosion
There are no solids and the velocities are expected to be low. Erosion allowance of 0.004 inch for components with low solids content (< 2 wt%) at low velocities is based on 24590-WTP-RPT-M-04-0008.

Conclusion:
Not a concern.

k Galling of Moving Surfaces
Not applicable.

Conclusion:
Not applicable.

l Fretting/Wear
No contacting surfaces expected.

Conclusion:
Not applicable.

m Galvanic Corrosion
No dissimilar metals are present.

Conclusion:
Not applicable.

n Cavitation
None expected.

Conclusion:
Not believed to be of concern.

o Creep
The temperatures are too low to be a concern.

Conclusion:
Not applicable.

p Inadvertent Nitric Acid Addition
Vessel routinely operates at low pH.

Conclusion:
Not applicable.

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References:

1. 24590-WTP-RPT-M-04-0008, Rev. 2, *Evaluation Of Stainless Steel Wear Rates In WTP Waste Streams At Low Velocities*
2. 24590-WTP-RPT-PR-04-0001, Rev. B, *WTP Process Corrosion Data*
3. Davis, JR (Ed), 1987, *Corrosion, Vol 13*, In "Metals Handbook", ASM International, Metals Park, OH 44073
4. Davis, JR (Ed), 1994, *Stainless Steels*, In ASM Metals Handbook, ASM International, Metals Park, OH 44073
5. Sedriks, AJ, 1996, *Corrosion of Stainless Steels*, John Wiley & Sons, Inc., New York, NY 10158

Bibliography:

1. Cole, HS, 1974, *Corrosion of Austenitic Stainless Steel Alloys Due to HNO_3 – HF Mixtures*, ICP-1036, Idaho Chemical Programs – Operations Office, Idaho Falls, ID
2. Hamner, NE, 1981, *Corrosion Data Survey*, Metals Section, 5th Ed, NACE International, Houston, TX
3. Jones, RH (Ed.), 1992, *Stress-Corrosion Cracking*, ASM International, Metals Park, OH 44073
4. Ohl, PC to PG Johnson, Internal Memo, Westinghouse Hanford Co, *Technical Bases for Cl- and pH Limits for Liquid Waste Tank Cars*, MA: PCO:90/01, January 16, 1990.
5. Uhlig, HH, 1948, *Corrosion Handbook*, John Wiley & Sons, New York, NY 10158
6. Van Delinder, LS (Ed), 1984, *Corrosion Basics*, NACE International, Houston, TX 77084
7. Wilding, MW and BE Paige, 1976, *Survey on Corrosion of Metals and Alloys in Solutions Containing Nitric Acid*, ICP-1107, Idaho Chemical Programs, Idaho National Engineering Laboratory, Idaho Falls, ID,

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PROCESS CORROSION DATA SHEET

Component(s) (Name/ID #) Cs concentrate breakpot (CNP-BRKPT-00002)
Cs evaporator eluate lute pot (CNP-VSL-00001)

Facility PTF

In Black Cell? Yes

Chemicals	Unit[1]	Contract Max		Non-Routine [3]		Notes
		Leach	No leach	Leach	No Leach	
Aluminum	g/l	2.30E-01	2.31E-01			
Chloride	g/l	8.85E-02	1.06E-01			
Fluoride	g/l	1.05E-01	1.26E-01			
Iron	g/l	1.69E-02	1.89E-02			
Nitrate	g/l	1.54E+01	8.61E+00	4.46E-04	4.46E-04	
Nitrite	g/l	4.88E-01	5.83E-01			
Phosphate	g/l	3.53E-01	4.13E-01			
Sulfate	g/l	1.88E-01	2.24E-01			
Mercury	g/l	5.47E-04	1.42E-04			
Carbonate	g/l	6.59E-01	7.24E-01			
Undissolved solids	wt%					
Other (NaMnO4, Pb,...)	g/l					
Other	g/l					
pH	N/A					Assumption 1
Temperature	°F					Note 2

List of Organic Species:

References

System Description: 24590-PTF-3YD-CNP-00001, Rev 0
Mass Balance Document: 24590-WTP-M4C-V11T-00005, Rev A
Normal Input Stream #: CXP11, CXP12, CNP02
Off Normal Input Stream # (e.g., overflow from other vessels): CNP01 acid charge
P&ID: N/A
PFD: 24590-PTF-M5-V17T-P0014, Rev 1
Technical Reports: N/A

Notes:

1. Concentrations less than 1x 10^{-4} g/l do not need to be reported; list values to two significant digits max.
2. Breakpot: Steam is used for transfer. The breakpot is normally empty and at ambient temperature most of the time.
   Vessel: Tnormal operating range 77 °F (eluate) to 140 °F (24590-PTF-M5C-CNP-00001, Rev 0)
3. Nitric acid charge (CNP01)

Assumptions:

1. Stream CXP12 post elution rinse pH approx 0.5, CXP11 elution stream pH approx. 0.3 or more.

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4.1.2 Cs Concentrate Breakpot (CNP-BRKPT-00002), Cs Evaporator Eluate Lute Pot (CNP-VSL-00001)

Routine Operations

Under normal operations, the eluant from the IX columns goes directly to the Cs concentrate breakpot, CNP-BRKPT-00002. Eluate is then gravity-fed through a lute pot, CNP-VSL-00001, into the separator vessel, CNP-EVAP-00001. CNP-BRKPT-00002 is vented to the vessel vent system and contains wash rings and purge air.

Non-Routine Operations that Could Affect Corrosion/Erosion

None identified.